

Masses and Moles

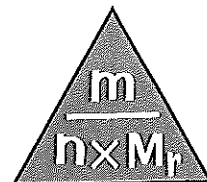
Look at this example of how to calculate the mass from the number of moles:

Mass of substance = number of moles x mass of 1 mole

Which is the same as saying....

Mass = number of moles x Relative Formula Mass

$$m = n \times M_r$$



Example

What is the mass of 2 moles of carbon?

m	=	n x Mr
	=	2 x 12
	=	24g

Use the Periodic Table in the front of the book to answer these questions:

Q1 What is the mass of...?

- | | |
|-------------------------------|------------------------------------|
| a) 1 mole of carbon atoms | f) 1 mole of oxygen molecules |
| b) 2 moles of sodium atoms | g) 2 moles of chlorine molecules |
| c) 2 moles of aluminium atoms | h) 1 mole of nitrogen molecules |
| d) 3 moles of lithium atoms | i) 0.5 moles of nitrogen molecules |
| e) 10 moles of iodine atoms | j) 0.1 moles of carbon molecules |

Q2 What is the mass of...?

- | | |
|---|--|
| a) 1 mole of carbon dioxide (CO ₂) | f) 10 moles of hydrochloric acid (HCl) |
| b) 5 moles of carbon dioxide (CO ₂) | g) 100 moles of sulphuric acid (H ₂ SO ₄) |
| c) 3 moles of water (H ₂ O) | h) 50 moles of sodium hydroxide (NaOH) |
| d) 2 moles of sulphur trioxide (SO ₃) | i) 30 moles of calcium oxide (CaO) |
| e) 3 moles of nitric acid (HNO ₃) | j) 25 moles of sodium chloride (NaCl) |

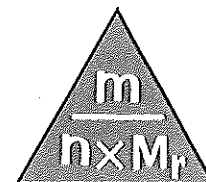
Q3 What is the mass of...?

- | | |
|--|---|
| a) 0.1 moles of copper oxide (CuO) | f) 0.05 moles of sodium hydroxide (NaOH) |
| b) 0.1 moles of calcium carbonate (CaCO ₃) | g) 0.58 moles of aluminium oxide (Al ₂ O ₃) |
| c) 0.01 moles of sulphuric acid (H ₂ SO ₄) | h) 0.1 moles of propanoic acid (C ₂ H ₅ COOH) |
| d) 0.2 moles of calcium chloride (CaCl ₂) | i) 0.5 moles of potassium manganate(VII) (KMnO ₄) |
| e) 0.25 moles of sodium carbonate (Na ₂ CO ₃) | j) 0.25 moles of Hydrated Magnesium Sulphate (MgSO ₄ ·7H ₂ O) |

Masses and Moles

Another example to read through. This time calculating the number of moles from a given mass:

$$\begin{aligned} \text{Number of moles} &= \frac{\text{mass of the substance}}{\text{mass of 1 mole of the substance}} \\ n &= \frac{m}{M_r} \end{aligned}$$



Example

How many moles are there in 88g of CO₂?

$$\begin{aligned} n &= \frac{88}{44} \\ &= \underline{2 \text{ moles}} \end{aligned}$$

mass of 1 mole



Q1 How many moles are there in...?

- | | |
|-------------------------|--------------------------------|
| a) 2g of helium atoms | f) 4g of oxygen molecules |
| b) 6g of carbon atoms | g) 213g of chlorine molecules |
| c) 16g of helium atoms | h) 254g of iodine molecules |
| d) 4g of sulphur atoms | i) 0.8g of oxygen molecules |
| e) 4g of hydrogen atoms | j) 0.56g of nitrogen molecules |

Q2 How many moles are there in...?

- | | |
|---|---|
| a) 88g of carbon dioxide (CO ₂) | f) 392g of sulphuric acid (H ₂ SO ₄) |
| b) 3.1g of sulphur dioxide (SO ₂) | g) 120g of magnesium oxide (MgO) |
| c) 73g of hydrogen chloride (HCl) | h) 4g of copper oxide (CuO) |
| d) 4g of sodium hydroxide (NaOH) | i) 2.8g of carbon monoxide (CO) |
| e) 560g of potassium hydroxide (KOH) | j) 170g of ammonia (NH ₃) |

Q3 How many moles are there in...?

- | | |
|--|--|
| a) 15.8g of potassium manganate (VII) (KMnO ₄) | f) 47.3g of sodium sulphate (Na ₂ SO ₄) |
| b) 40.5g of zinc oxide (ZnO) | g) 0.78g of aluminium hydroxide (Al(OH) ₃) |
| c) 1.6g of bromine (Br ₂) | h) 8g of ammonium nitrate (NH ₄ NO ₃) |
| d) 5.6g of calcium oxide (CaO) | i) 298g of ammonium phosphate ((NH ₄) ₃ PO ₄) |
| e) 37g of calcium hydroxide (Ca(OH) ₂) | j) 0.92g of ethanol (C ₂ H ₅ OH) |

Top Tips:

You've gotta be able to convert between mass and moles — so you need the formula triangle. But make sure you really understand it — then it's so much easier to remember.